Appomattox River TMDL Development

Final Public Meeting

3/11/2004

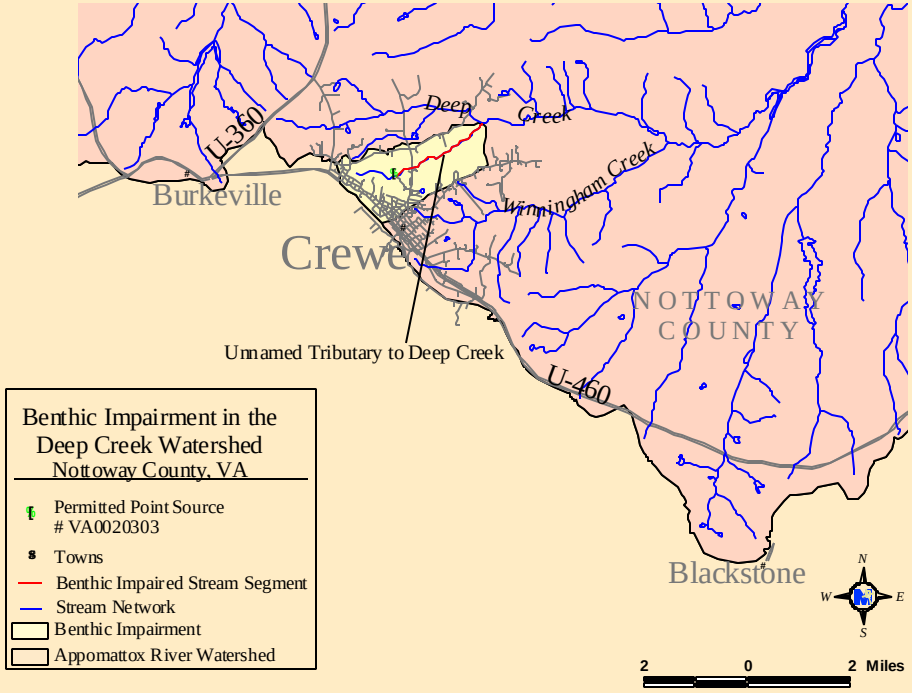
The Lower Appomattox River

There are 11 impaired segments in the lower portion of the watershed:

- 1 segment violating Virginia's General Water Quality Standard (Benthic)
- 10 segments violating Virginia's fecal bacteria standard

The Benthic Impairment

XT Deep Creek – An unnamed tributary to Deep Creek (first-order) passing by the Crewe STP.



General Standard

"All state waters shall be free from sewage, industrial waste, or other waste substances ... which are harmful to human, animal, plant, or aquatic life"

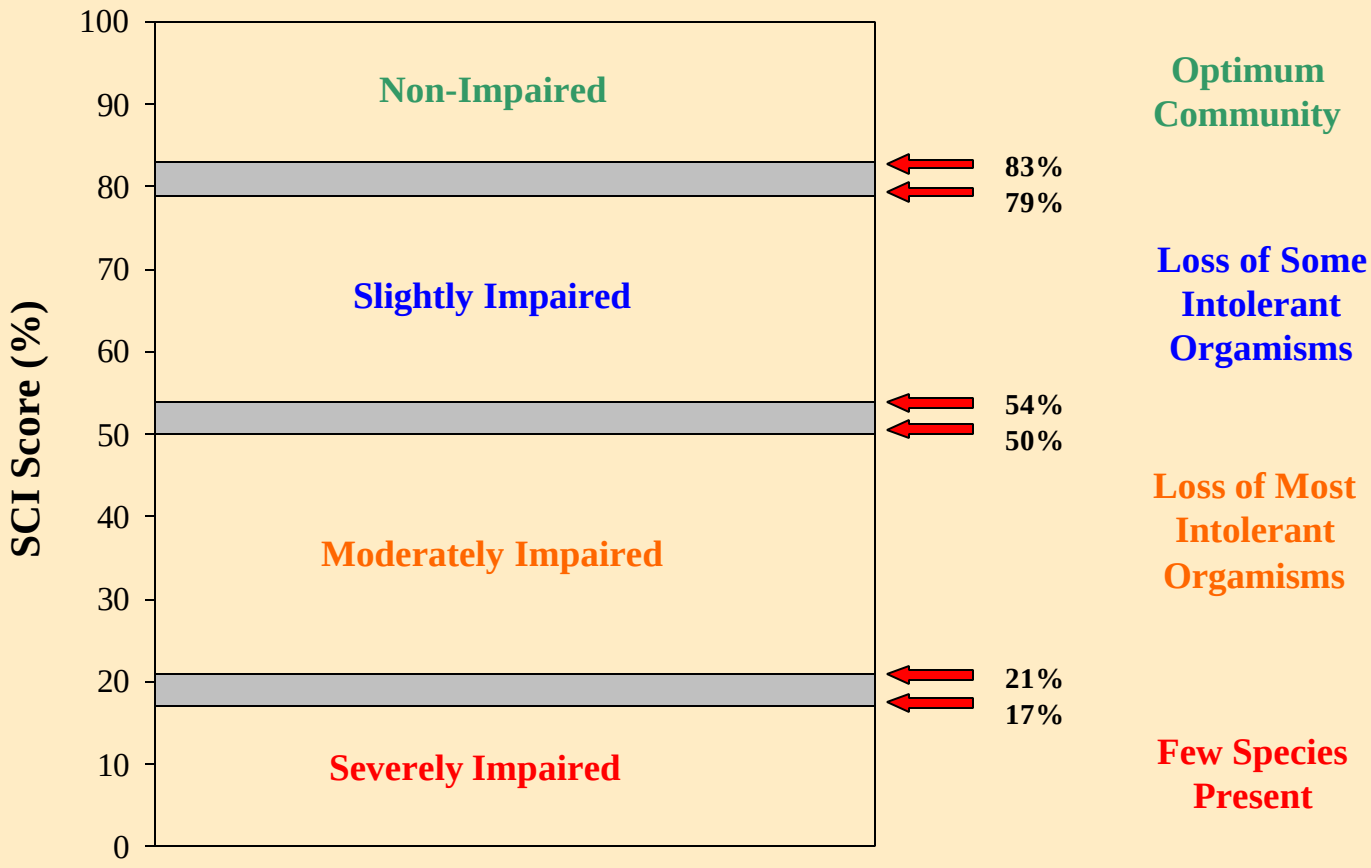
(9 VAC 25-260-20)

Stressor Identification

Stressors identified in the Unnamed Tributary to Deep Creek include:

- *Sub-optimal natural habitat*
- *Overflows from the Town of Crewe Sewage Treatment Plant*

Interpretation of Stream Condition Index (SCI) scores



SCI scores for XT Deep Creek

Collection		Impaired Station		Upstream Reference	
Year	**Month**	**SCI**	**Condition**	**SCI**	**Condition**
1994	November	6.2	SI	37.0	MI
1995	May	12.3	SI	18.3	SI-MI
1996	May	6.6	SI	38.2	MI
1996	October	NA	NA	24.3	MI
1996	November	11.2	SI	11.4	SI-MI
1997	May	16.2	SI	41.1	MI
1997	November	26.0	MI	44.4	MI
1998	May	22.4	MI	37.0	MI
2002	June	27.3	MI	43.0	MI
2002	September	33.4	MI	33.8	MI

General Quality Allocations

Average annual loads of raw sewage allocated to XT Deep Creek.

Source	Load (kg/yr)
WLA[1]	0
LA	0
MOS	*Implicit*
TMDL	0

[1] The only point source permitted in the drainage is the Crewe STP (VPDES # VA0020303).

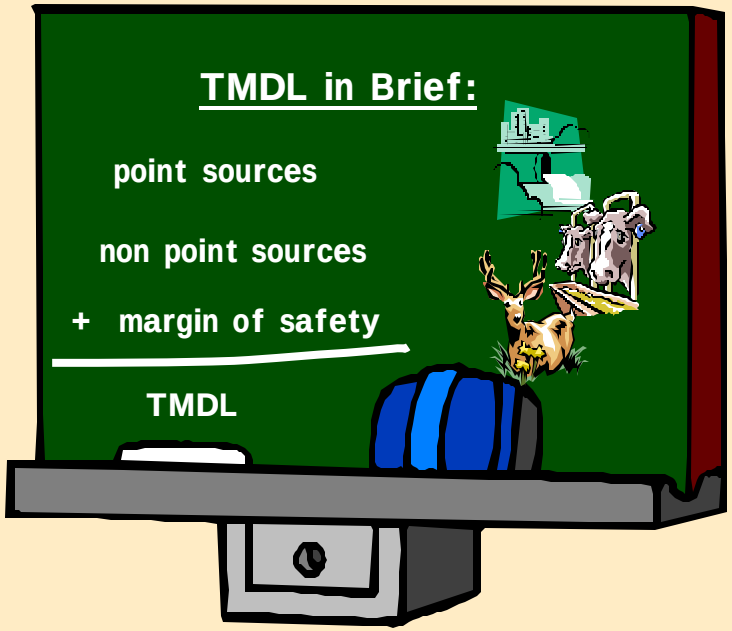
Fecal Coliform Impairments

- 10 segments violating Virginia's fecal coliform instantaneous standard in the Lower portion of the watershed

Impairment	Station	Count (#)	Minimum (cfu/100ml)	Maximum (cfu/100ml)	Violations[1] (%)	Violations[2] (%)
Appomattox River (1)	2-APP118.04	107	17	16,000	19	28
Appomattox River (2)	2-APP012.79	140	18	16,000	12	27
Appomattox River (3)	2-APP001.53	145	18	9,200	10	21
Deep Creek	2-DPC005.20	57	18	16,000	11	25
Flat Creek	2-FLA001.95	58	78	16,000	21	40
Nibbs Creek	2-NBB003.65	44	20	5,100	16	50
Swift Creek (1)	2-SFT036.00	58	18	4,000	10	14
Swift Creek (2)	2-SFT019.15	40	18	16,000	10	13
Swift Creek (3)	2-SFT004.92	54	18	16,000	9	20
West Creek	2-WET004.96	22	45	16,000	14	41

Fecal Bacteria
TMDL Development

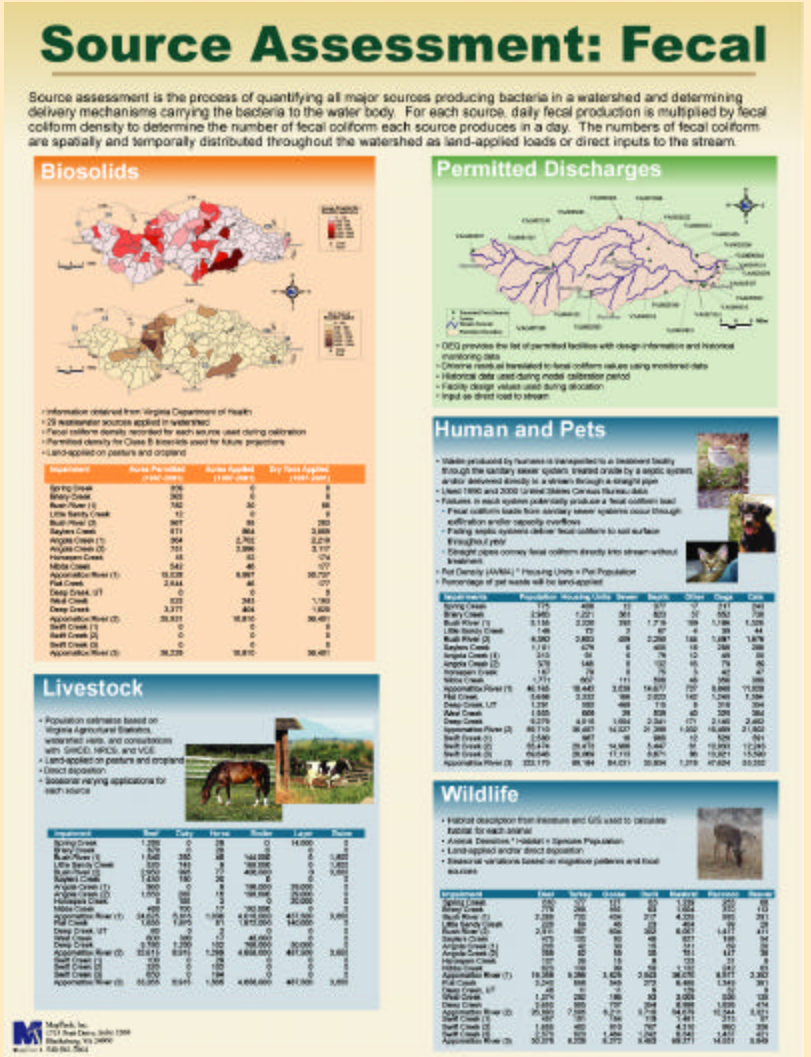
- Source Assessment
  - Bacterial Source Tracking
- Modeling
  - Hydrology
  - Water Quality
- Load Allocation



Source Assessment

Process of quantifying all major sources producing bacteria and determining delivery mechanism carrying bacteria to stream.

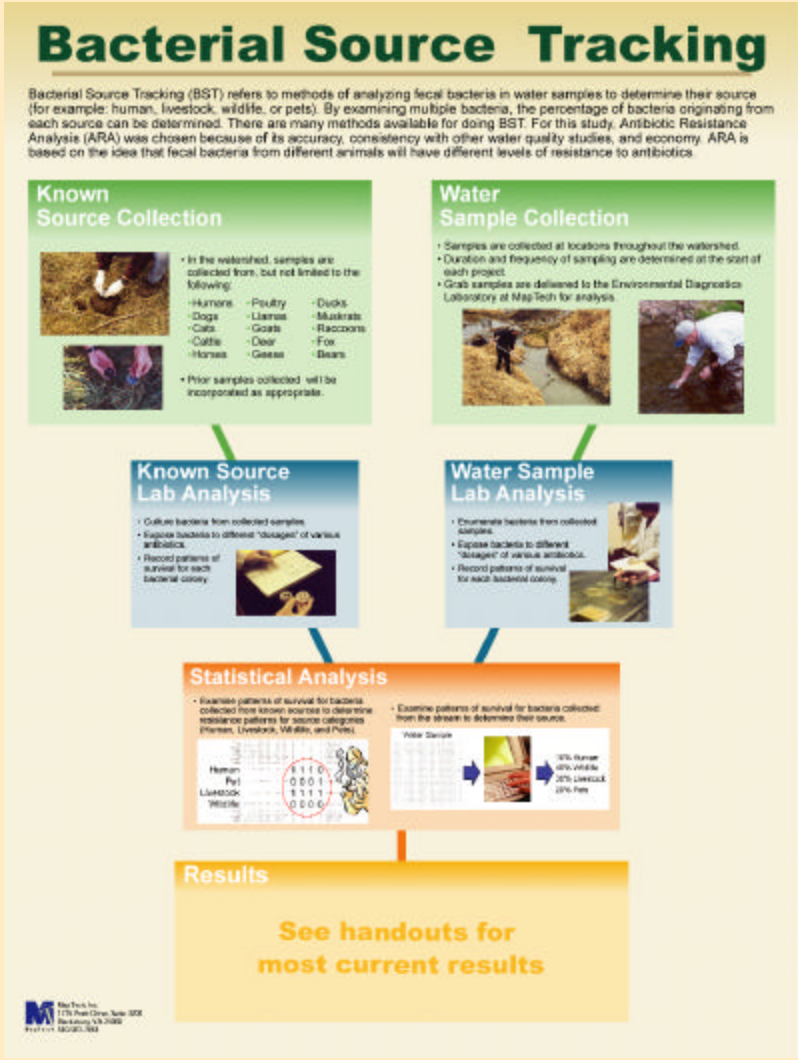
- Identification, quantification and delivery mechanisms
  - Permitted discharges
  - Human
  - Pets
  - Livestock
  - Wildlife



Bacterial Source Tracking

Laboratory method of analyzing fecal bacteria in water samples to determine their source (*e.g.* human, pets, livestock, or wildlife).

- Monthly Samples Collected for 1 Year
- Useful Tool for Assessing the Sources of Fecal Contamination
- Should Be Considered in Conjunction with Other (Field) Data



Bacterial Source Tracking - Results

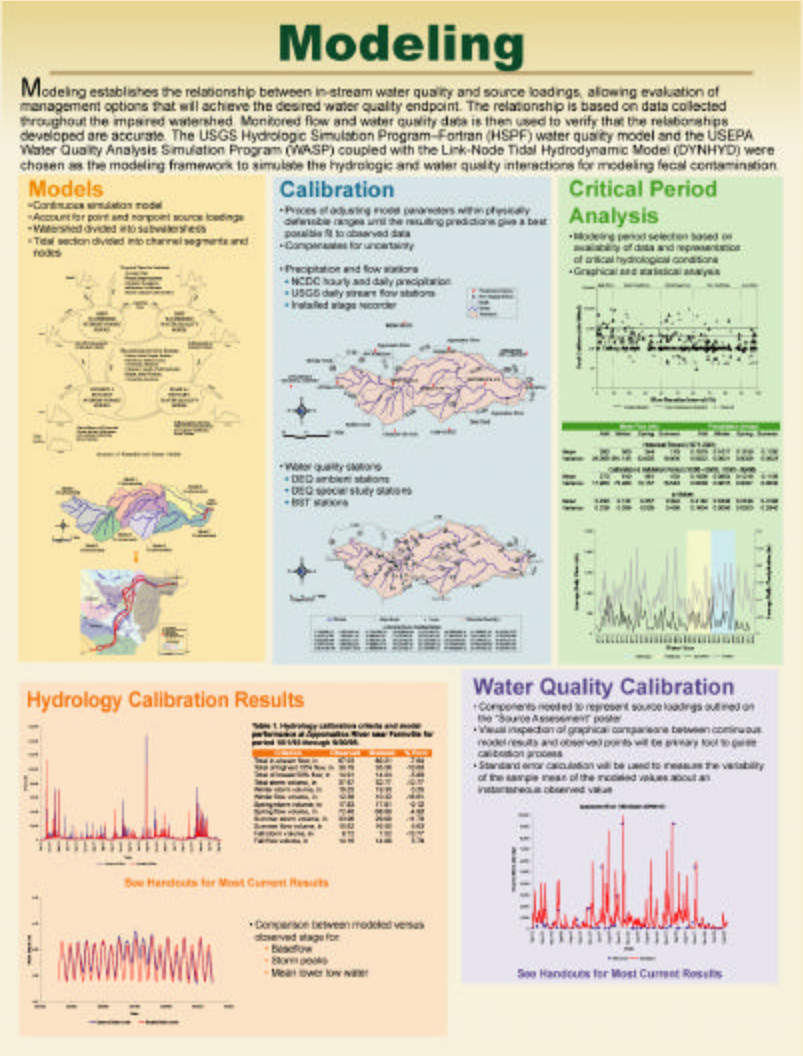
Station ID	Stream	Wildlife	Human	Livestock	Pet
2APP001.53	Appomattox River	17%	5%	50%	28%
2APP012.79	Appomattox River	21%	10%	46%	23%
2APP050.23	Appomattox River	17%	7%	55%	21%
2APP068.93	Appomattox River	26%	6%	40%	28%
2APP090.12	Appomattox River	18%	12%	52%	18%
2DPC005.20	Deep Creek	16%	9%	59%	16%
2FLA001.95	Flat Creek	24%	8%	53%	15%
2NBB001.54	Nibbs Creek	22%	6%	57%	15%
2NBB003.65	Nibbs Creek	19%	12%	58%	11%
2SFT004.92	Swift Creek	12%	10%	51%	27%
2SFT019.15	Swift Creek	28%	16%	41%	15%
2SFT036.00	Swift Creek	34%	8%	24%	34%
2WET004.96	West Creek	24%	3%	60%	13%

** Percentages given are weighted averages from multiple BST samples.*

Modeling

Establishes relationship between in-stream water quality and source loadings.

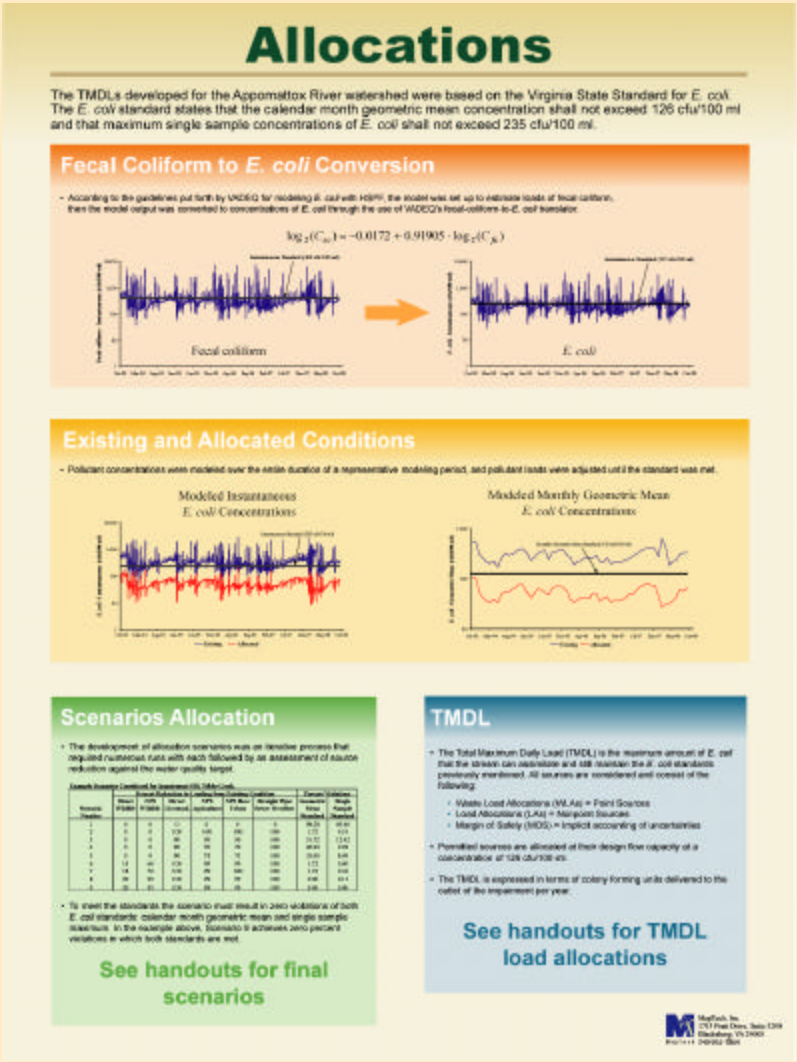
- Model set-up
- Calibration
  - Hydrology
  - Water quality



Load Allocation

Determine waste load and load allocations along with margin of safety for a reduction scenario that meets WQS

- Develop load reduction scenarios
- Model scenarios
- Select a scenario that meets WQS as the TMDL



Load Allocations – Stage I/Management Scenarios

Reduction percentages for the Stage I implementation.

Impairment Name	Direct Wildlife	NPS Wildlife	Direct Livestock	NPS Pasture / Livestock Access/ Cropland	NPS Res./ Urban	Straight Pipe/ Sewer Overflow	% Single Samples Exceeding 235 cfu/ 100ml
Appomattox River (1)	0	0	90	50	50	100	14.03
Appomattox River (2)	0	0	90	50	50	100	11.89
Appomattox River (3)	0	0	0	50	50	100	12.5
Nibbs Creek	0	0	90	50	50	100	12.42
Flat Creek	0	0	90	50	50	100	12.6
West Creek	0	0	90	50	50	100	24.82
Deep Creek	0	0	90	50	50	100	24.71
Swift Creek (1)	0	0	90	25	25	100	5.86
Swift Creek (2)	0	0	75	45	45	100	9.97
Swift Creek (3)	0	0	25	45	45	100	9.75

Load Allocations – Example Scenarios for Appomattox River Watershed

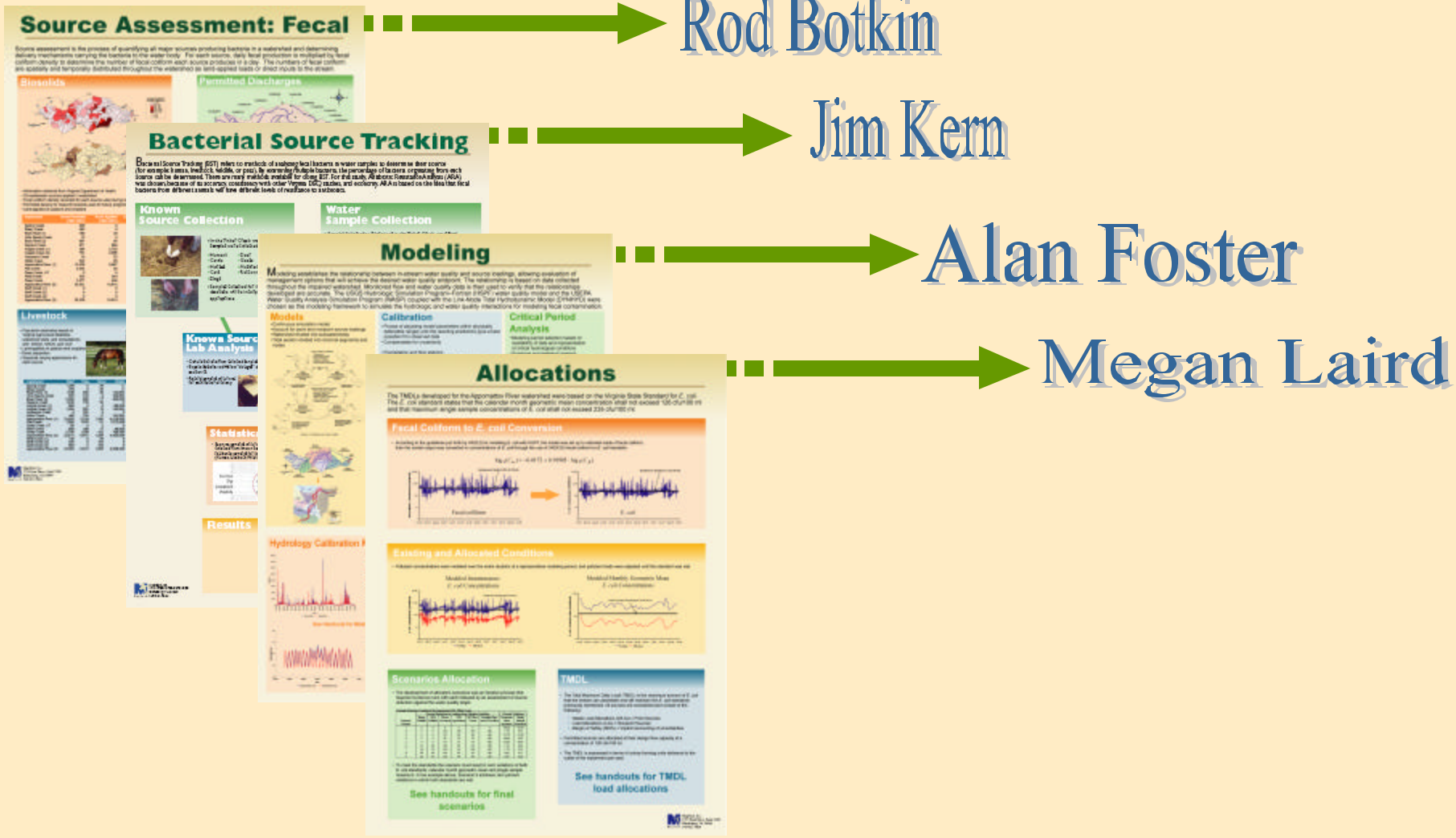
Scenario Number	Percent Reduction in Loading from Existing Condition						Percent Violations	
	Direct Wildlife	NPS Wildlife	Direct Livestock	NPS Pasture / Livestock Access / Crops	NPS Res./ Urban	Straight Pipe/ Sewer Overflow	GM > 126 cfu/ 100ml	Single Sample Exceeds 235 cfu/ 100ml
1	0	0	0	0	0	0	33.33	17.7
2	0	0	100	100	100	100	20	2.58
3	0	0	90	50	50	100	23.33	7.51
4	0	0	50	50	50	100	25	9.7
5	30	0	100	80	80	100	13.79	3.55
6	38	78	100	99	99	100	0	0

Load Allocations – the TMDLs

Impairment	WLA (cfu.year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Appomattox River (1)	4.74E+12	6.86E+14		6.90E+14
Appomattox River (2)	1.40E+13	5.87E+14		6.01E+14
Appomattox River (3)-tidal	9.62E+13	1.02E+15		7.85E+14
Deep Creek (FC)	1.38E+12	1.05E+14		1.06E+14
Flat Creek	8.32E+11	8.72E+13	*Implicit*	8.80E+13
Nibbs Creek	8.32E+11	1.20E+13		1.29E+13
Swift Creek (1)	8.37E+09	2.01E+13		2.01E+13
Swift Creek (2)	3.80E+11	8.38E+13		8.42E+13
Swift Creek (3)	5.82E+11	1.28E+14		1.29E+14
West Creek	0.00E+00	3.91E+13		3.91E+13

** All loads presented in the TMDL table are given in cfu/year for E. coli*

Poster Session



Contact Information

- Phillip McClellan, MapTech
  - 1715 Pratt Drive – Suite 3200
  - Blacksburg, VA 24060
  - 540-961-7864
  - Email pmcclellan@maptech-inc.com
  - Web http://www.maptech-inc.com

- TMDL Documents
  - Chris French, DEQ TMDL Coordinator
  - Piedmont Regional Office
  - 804-527-5124
  - Email rcfrench@deq.state.va.us
  - Web http://www.deq.state.va.us/tmdl/